**2.2 velocity, speed, and acceleration**

1. Explain the difference between velocity, acceleration, and speed.

2. A diver jumps from a platform diving board that is 32 feet above the water. The position of the diver can be modeled by *s(t) = -16t2+16t+32*, where s is his position and t is the seconds that have gone by since he jumped.

a. When does the diver hit the water?

b. What is his velocity upon impact?

**Use this general model for free falling objects to solve the following (position in feet):**

***S(t) = -16t2+V0 t +S0,***

3. A marble is dropped from the top of the empire state building.

a. Determine the position and velocity functions for the marble

b. What is the average velocity for the first 3 seconds of flight?

c. What is the **speed** of the marble when t = 0? t = 3? t = 6?

d. How long does a person looking up from the ground have to evade the marble?

e. What is the velocity of the marble hitting the ground?

4. How much does the velocity upon impact increase if a person threw the marble downward at -22 fps?

**Use this general model for free falling objects to solve the following (position in meters):**

***S(t) = -4.9t2+V0 t +S0,***

5. An arrow is shot upward from standing (about 1.5 meters) with an initial velocity of 102 meters per second.

a. What is its velocity after 1 seconds?

b. After 7 seconds?

c. What can you conclude about the arrow’s flight between these times based on the velocities?

6. To estimate the height of a tree, Erin climbed all the way to the top and dropped a stone to a pool of water below. The splash was seen 6.8 seconds after she dropped it. How tall is the tree?